

## CLAIMS

1. A photocurrent-to-binary signal conversion apparatus comprising:

5 a light receiving element for receiving a light signal so that a photocurrent in response to said light signal flows through said light receiving element;

an amplifier, connected to said light receiving element, for converting said photocurrent into a  
10 detection voltage;

a reference voltage generating circuit, connected to said amplifier, for offsetting said detection voltage on the side of said detection voltage to generate a reference voltage; and

15 a comparator, connected to said amplifier and said reference voltage generating circuit, for comparing said detection voltage with said reference voltage to generate a binary signal in accordance with whether or not said detection voltage is higher than said reference voltage.

20 2. The photocurrent-to-binary signal conversion apparatus as set forth in claim 1, wherein said light receiving element comprises a photodiode having a grounded anode.

3. The photocurrent-to-binary signal conversion apparatus as set forth in claim 1, wherein said amplifier  
25 comprises a non-inverting amplifier, and said reference voltage generating circuit comprises an inverting amplifier.

4. The photocurrent-to-binary signal conversion apparatus as set forth in claim 1, wherein said amplifier comprises:

30 an operational amplifier having an inverting input connected to said light receiving element, a grounded non-inverting input, and an output for outputting said detection voltage; and

a negative feedback resistor connected between the output and non-inverting input of said operational amplifier.

5        5.    The photocurrent-to-binary signal conversion apparatus as set forth in claim 1, wherein said reference voltage generating circuit comprises:

an operational amplifier having a non-inverting input connected to said amplifier, an inverting input and an output for generating said reference voltage;

10        a negative feedback resistor connected between the output and inverting input of said operational amplifier; and

a constant current source connected to the inverting input of said operational amplifier and said  
15        negative feedback resistor.

6.    A photocurrent-to-binary signal conversion apparatus comprising:

20        a light receiving element for receiving a light signal so that a photocurrent in response to said light signal flows through said light receiving element;

an amplifier, connected to said light receiving element, for converting said photocurrent into a detection voltage;

25        a reference voltage generating circuit, connected to an intermediate stage of said amplifier, for offsetting a voltage at said intermediate stage on the side of said voltage at said intermediate stage to generate a reference voltage, said voltage at said intermediate stage having the same phase as said detection voltage; and

30        a comparator, connected to said amplifier and said reference voltage generating circuit, for comparing said detection voltage with said reference voltage to generate a binary signal in accordance with whether or not said detection

voltage is higher than said reference voltage.

7. The photocurrent-to-binary signal conversion apparatus as set forth in claim 6, wherein said light receiving element comprises a photodiode having a grounded anode.

5 8. The photocurrent-to-binary signal conversion apparatus as set forth in claim 6, wherein said amplifier comprises a non-inverting amplifier, and said reference voltage generating circuit comprises an inverting amplifier.

10 9. The photocurrent-to-binary signal conversion apparatus as set forth in claim 6, wherein said amplifier comprises:

a first operational amplifier having an inverting input connected to said light receiving element, a grounded non-inverting input, and an output for outputting  
15 said detection voltage; and

a negative feedback resistor connected between the output and non-inverting input of said first operational amplifier,

said first operational amplifier comprising a  
20 differential amplifier for amplifying a difference between voltages at said inverting input and said non-inverting input and an output amplifier connected to said differential amplifier for amplifying an output signal thereof to generate said detection voltage, said differential amplifier forming  
25 said intermediate stage.

10. The photocurrent-to-binary signal conversion apparatus as set forth in claim 6, wherein said amplifier comprises:

30 a first operational amplifier having an inverting input connected to said light receiving element, a grounded non-inverting input, and an output for outputting said detection voltage; and

a negative feedback resistor connected

between the output and non-inverting input of said first operational amplifier,

5                   said first operational amplifier comprising a plurality of inverter stages connected in series, one stage of said inverter stages except for a final stage of said inverter stages forming said intermediate stage.

11. The photocurrent-to-binary signal conversion apparatus as set forth in claim 6, wherein said reference voltage generating circuit comprises:

10                   a second operational amplifier having a non-inverting input connected to said intermediate stage of said amplifier, an inverting input and an output for generating said reference voltage;

15                   a negative feedback resistor connected between the output and inverting input of said second operational amplifier; and

                  a constant current source connected to the inverting input of said second operational amplifier and said negative feedback resistor.

20           12. The photocurrent-to-binary signal conversion apparatus as set forth in claim 6, further comprising a delay circuit, connected between said reference voltage generating circuit and said comparator, for delaying said reference voltage.

25           13. The photocurrent-to-binary signal conversion apparatus as set forth in claim 12, wherein said delay circuit comprises:

30                   a resistor connected between an output of said amplifier and an output of said reference voltage generating circuit; and

                  a capacitor connected to the output of said reference voltage generating circuit.